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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/033,353

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Robert F. Richards

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24197

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02/26/2004

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EXAMINER

DOUGHERTY, THOMAS M

ART UNIT

PAPER NUMBER

2834

DATE MAILED: 02/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/033,353

Applicant(s)

RICHARDS ET AL.

Examiner

Thomas M. Dougherty

Art Unit

2834

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 06 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-5,7-21 and 75-107 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-5,7-15,18,21 and 75-103 is/are allowed.
- 6) ☒ Claim(s) 16,17,19,20 and 104-107 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 103.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 16 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Ohio University (WO 94 18433 A). The Ohio document shows (figs. 1, 2, 5, 5A) a structure having a plurality of micro-transducers (fig. 1), the structure comprising: a first major layer (34); a second major layer (44) juxtaposed to the first layer (34); a plurality of fluid-tight cavities (30, 40) cooperatively formed between the first and second major layers (34, 44); a working fluid (p. 4, l. 31) contained in the cavities; a plurality of first electrodes (e.g. 512) carried by the first major layer at each of said cavities (30, 40); a plurality of piezoelectric members (522) carried by the first electrodes (512) at each of said cavities (30, 40); and a plurality of second electrodes (518) carried by the piezoelectric members (522) at each of said cavities; wherein each of the first electrodes (512) comprises a unitary first metallic layer overlaying the first surface, the plurality of piezoelectric members (522) comprise a unitary piezoelectric layer overlaying the first metallic layer (512), and the plurality of second electrodes (518) comprise a unitary second metallic layer overlaying the piezoelectric layer (522).

The working fluid occupies the cavities (30, 40).

Claims 16, 17 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Bullock (US 4,149,936). Bullock shows (fig. 8) a structure having a plurality of transducers (1), the structure comprising: a first major layer (not numbered); a second major layer (not numbered) juxtaposed to the first layer; a plurality of fluid-tight cavities (16, 19) cooperatively formed between the first and second major layers; a working fluid contained in the cavities; a plurality of first electrodes (not numbered) carried by the first major layer at each of said cavities (16, 19); a plurality of piezoelectric members (not numbered) carried by the first electrodes at each of said cavities (16, 19); and a plurality of second electrodes (not numbered) carried by the piezoelectric members at each of said cavities (16, 19); wherein each of the first electrodes comprises a unitary first metallic layer overlaying the first surface, the plurality of piezoelectric members comprise a unitary piezoelectric layer overlaying the first metallic layer, and the plurality of second electrodes comprise a unitary second metallic layer overlaying the piezoelectric layer.

The working fluid occupies the cavities (16, 19).

There further is an intermediate layer (18) disposed between the first and second major layers, the intermediate layer (18) defining a plurality of recesses that define respective cavities between the first and second major layers.

Claims 104 and 105 are rejected under 35 U.S.C. 102(b) as being anticipated by Mason (US 2,522,389). Mason teaches (claim 5) a transducer comprising: a body (fig. 1) defining a fluid-tight cavity; and a compressible and expansible working fluid (cl. 5) contained within the cavity, the body having a piezoelectric unit situated adjacent the

cavity, and the piezoelectric unit being operable as an actuator to compress the working fluid whenever an electric field is applied to the piezoelectric unit and operable as a generator to generate an electric charge whenever the working fluid expands.

The working fluid occupies the cavity.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bullock (US 4,140,936) in view of Nakamura et al. (US 4,651,042). Given the invention of Bullock as noted above, it is not clear that his intermediate layer material is photo-resist. Nakamura et al. note (col. 3, ll. 52-68) use of a photo-resist layer in the manufacture of their device, which is a piezoelectric actuation device. Nakamura et al. don't show a pair of membranes defining a cavity with a fluid in it. It would have been obvious to one having ordinary skill in the art to use a photo-resist layer on the intermediate portion of the device of Bullock since such layers are typically used in forming piezoelectric devices where subsequent etching allows a device to be completed and since the device of Bullock shows layers and precision placement which feature and requirement lend themselves well to use of a photo-resist cover.

Claims 106 and 107 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bullock (US 4,140,936) in view of Mason (US 2,522,389). Given the invention of

Bullock as noted above, one of his membranes is more flexible than the other (one, 19, is rubber, the other comprises the piezoelectric element with its electrodes and a metal support), however he does not clearly use his device to generate electricity or compress a working fluid. Given the invention of Mason as noted above, he doesn't show two membranes per se.

It would have been obvious to one having ordinary skill in the art to use the device of Bullock at the time his invention was made to compress liquid and generate electricity as is taught by Mason, thereby making the use or intended use of the device more versatile.

***Allowable Subject Matter***

Claims 1-5, 7-15, 18, 21 and 75-103 are allowed.

The following is an examiner's statement of reasons for allowance: In addition to reasons cited previously, the prior art does not explicitly show nor teach use of a simultaneously, two-phase liquid-gas in a sealed cavity in a structure where that cavity is formed by two membranes, with the cavity therebetween, wherein one of the membranes is comprised of a piezoelectric material with electrodes on its opposing surfaces. Nor is shown by the prior art, within the date requirements, such a structure excepting the two phase citation, but further including a thermal energy flow into the micro-transducer, thereby causing one of the layers to distend thereby generating an electrical charge.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

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accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Direct inquiry concerning this action to Examiner Dougherty at (571) 272-2022.

*tmd*  
tmd

February 23, 2004

*Thomas M. Dougherty*  
**THOMAS M. DOUGHERTY**  
**PRIMARY EXAMINER**  
**GROUP 2100**